

Across Machine Lines in COBOL, D. S. Fredericks and C. R. Warburton, *Communications of the ACM* 8, No. 12, 731-735 (December 1965). The production of a large file-maintenance-and-retrieval program system written in COBOL is described. The COBOL language was used specifically to enable the system to operate on three IBM computers.

The Application of a New System for Monitoring the Surgical Patient, J. D. Michenfelder*, H. R. Terry, Jr.*, F. R. Anderholm, and D. G. Shaw, *Proceedings of the Eighteenth Annual Conference on Engineering in Medicine and Biology*, 233 (November 1965). An IBM-Mayo Clinic surgical monitoring system was designed to provide two major functions; first, as a monitor of vital physiologic variables to improve care of the anesthetized patient, and second, as an investigational tool with which to accept, collect, and store data from diverse inputs. This information is displayed in the operating room as well as in adjacent areas for responsible physicians or interested observers. In addition to real-time display of these data, a permanent record is also made.

* Mayo Clinic, Rochester, Minnesota.

The Application of Variational Techniques to Real-Time Command and Control of an Entry Vehicle, Martin Rush and Alice Schmidt, *Record of the Twelfth Annual East Coast Conference on Aerospace and Navigational Electronics*, 3.4.6-1 to 3.4.6-16 (1965). Variational techniques are applied to command and control of a maneuvering entry vehicle. The application of these techniques can provide a ground processor with the capability for impact control and real-time monitoring of the vehicle's maneuver capability. The paper presents the analytic approach and simulation results of applying such techniques in the Gemini reentry phase, but these same techniques are generally applicable to other vehicles and mission phases.

Automated Experiment Systems—A Practical Guide, H. Cole and Y. Okaya, *Laboratory Management* 3, No. 11, 32 (November 1965). The computer-controlled x-ray diffractometer (CCXD) which has been operating for two years at the IBM Thomas J. Watson Research Center has to-date produced significant new structural information on more than two dozen crystalline materials. Beyond the technical value of the immediate results to crystallographers, however, operation of the CCXD demonstrates the major concepts and benefits of automated experiment systems. A review of the CCXD system may be particularly useful to laboratory management because many other x-ray diffractometers are now being operated both manually and in open-loop automated experiment systems. Therefore, together with the diffractometer under full computer control at the Research Center, all degrees of automation—from zero to complete—are represented in running a single common experiment.

Computer Controlled Data Reduction, R. E. Blue, *Proceedings of the 20th Annual ISA Conference*, Part III, 7.4-11-7.4-17 (October 1965). This paper develops a framework for discussing four papers to be presented at the 20th Annual International Conference and Exhibit Workshop on "Computer Controlled Data Reduction." Developments in the fields of data acquisition and computing are analyzed in terms of the future use of computer control techniques.

Abstracts

from recent
papers by
IBM authors

Computers for Information Retrieval, A. D. Pratt, *Ideas for Management, the Proceedings of the Eighteenth International Systems Meeting*, 52-61 (November 1965). Information Retrieval is a computer application which differs in some very significant respects from applications most familiar in the current day. One of the most significant differences is the need to organize extremely large files for inquiry and response on a near-real-time basis. Development of new searching strategies, synthesized from older methods, combined with improving technological capability for large-capacity, direct-access devices, is permitting the IR systems designer to approach this goal. It is possible to envision realistic systems, not hypothetical ones, which will connect a user with a console in his office to a large IR file located elsewhere, so that he can inquire at will and get responses in a manner of seconds or minutes.

Data Acquisition For Computer Analysis and Display of the Radioisotope Scan, D. W. Chaapel, W. N. Tauxe*, and A. C. Sprau, *Proceedings of the Eighteenth Annual Conference on Engineering in Medicine and Biology*, 162 (November 1965). This paper compares current techniques for data acquisition and display of radioisotope scanner information, describes a method of acquisition of such data preparatory to computer analysis and display, and discusses computer analysis techniques, their contribution to scan improvement, and the increased flexibility possible using computer displays.

* Mayo Clinic, Rochester, Minnesota.

Digital Simulation for Bio-Medical System Studies, R. N. Linebarger and R. D. Brennan, *Proceedings of the Eighteenth Annual Conference on Engineering in Medicine and Biology*, 129 (November 1965). Within the past few years, digital computers have been increasingly applied to solving system analysis problems. Now, digital computer techniques are being successfully applied to the simulation of complex dynamic systems, long the exclusive domain of the analog computer. Over 28 separate computer languages have been successfully used to simulate continuous system dynamics on a digital computer. DSL/90 provides an easily-learned tool for digitally simulating complex bio-medical systems by personnel relatively untrained in digital computer programming. These techniques combine the best features of analog block programming and digital solution methods—the result is a significant new tool for bio-medical system analysis.

Digital Simulation for Control System Design, R. N. Linebarger and R. D. Brennan, *Instruments and Control Systems* 38, No. 10, 147-152 (October 1965). Digital computer languages for simulating control-system responses are new and powerful tools for the design engineer, and considerably extend his ability to develop automated equipment for specific control applications. This paper discusses how the computer simulation field is being rapidly expanded by the introduction of many new program languages. A forecast of future trends in languages, applications, numerical methods, and graphic input/output devices is also made.

Emulation of Large Systems, S. G. Tucker, *Communications of the ACM* 8, 12, 753-761 (December 1965). The conversion problem and a new technique called emulation are discussed. The technique of emulation is developed and includes sections on both the central processing unit and input/output. This general treatment is followed by three sections that describe in greater detail the implementation of compatibility features using the emulation techniques for the IBM 7074, 7080 and 7090 systems on IBM SYSTEM/360.

1401 Compatibility Feature on the IBM System/360 Model 30, M. A. McCormack, T. T. Schansman, and K. K. Womack, *Communications of the ACM* 8, No. 12, 773-776 (December 1965). The "second generation" of stored-program computers, of which the IBM 1400 series was a part, brought EDP into the mass market for the first time on a large scale. As this era unfolded, rapid changes in technology led to rapid obsolescence of data processing equipment. Programs written for a particular system required tedious conversion as incompatible new machines came into use. The IBM system/360 has been designed with the conversion problem specifically in mind. One of the conversion aids available on the Model 30 is the 1401 compatibility feature. This feature, in conjunction with other aids, permits a smooth and inexpensive transition to optimum use of the new system.

Future of Magnetic Memories, G. Kohn, *Proceedings of the IFIP Congress 1*, 131-136 (1965). Although magnetic memory devices have played a predominant role in the computer technology of the last ten years, they still have great potentialities which will lead to larger and faster computer memories for the future. Some characteristic directions in the future technology of electronically addressed computer memories are discussed here. In large capacity storage systems with more than 10^7 bits, the problems of batch fabrication and redundancy against element failures are to be considered. In read only memories and in "changeable memories" a very fast access is required. In competition to the classic electronic access, optical systems might become of more interest together with transparent ferrimagnetic garnets. For very fast memories, magnetic films are, due to their nanosecond switching time, the most promising elements. Present film memories are speed-limited to about 100 nsec cycle time by the drive and sensing circuits. New approaches which employ non-destructive read operation of the films, evaporated strip-line arrays, and high-speed circuits are reviewed. Read cycle time of less than 20 nsec have already been achieved experimentally.

A General Method of Variation of Parameters for Numerical Integration, William H. Goodyear, *Astronomical Journal* 70, No. 8, 524-526 (October 1965). The method of variation of parameters is applied to perturbed motion by defining the parameters as the initial coordinates of an osculating two-body trajectory. A completely general closed-form solution of the two-body problem is used to determine coordinates and partial derivatives of the osculating trajectory. This frees the method from singularities associated with different types of two-body motion. The numerical integration of the differential equations for the parameters provides a relatively simple and completely general technique for the computation of perturbed trajectories.

Graphic Data Processing, F. V. Windes, *Graphic Science* 7, No. 12, 22 (December 1965). Designers and draftsmen can effectively use graphic data processing to control, manipulate, analyze, update and distribute design information without having to be expert computer programmers. Systems such as those now being built by IBM for graphic data processing become valuable tools for designer/draftsmen.

The IBM 7770 and 7772 Audio Response Unit, a New Type of Output Unit for Data Processing Systems, W. G. Spruth, *Elektronische Rechenanlagen* 7, No. 5, 268-271 (October 1965). A general description of both the IBM 7770 and the 7772 Audio Response Units is given. The vocabulary needed for the audio output function is stored in the 7770 in analog form on a rotating drum, while the 7772 Audio Response Unit uses the system's random access file for digital storage of the audio information. A brief description of Audio Response Unit applications is given.

The IBM 9020: A Modular Multi-Processing System for NAS, J. R. Wood, *Proceedings of the Third International Aviation Research and Development Symposium*, 1-14 (November 1965). The Central Computer Complex (ccc) of the National Airspace System (NAS) is an IBM 9020, a large-scale data processing system. The 9020 was designed to perform in the exact type of environment specified for the ccc: a large, fast-response, real-time control system with particularly stringent requirements for around-the-clock operation.

Management Games and Programmed Instruction, A. Schulz, *Grundlagenstudien aus Kybernetik* 6, No. 3, 85-96 (September 1965). The first part of this paper reports on experience with management games at universities, and a proposal for measuring their effectiveness is made. The second part compares management games with programmed instruction—a comparison based on the fact that a computer is used as a teaching machine in both cases. Teaching in European universities, in many cases, lacks interaction between lecturer and student. This paper shows how management games might be improved to provide such interaction.

An Optical Pencil-Mark Reading System, J. F. Bene, *Design News* 20, No. 23, 122-127 (November 10, 1965). This mark-read head uses a significantly new approach in reading ordinary pencil marks from an 8-1/2 x 11-in. sheet. Silicon solar cells are used as transducers to optically scan a sheet. Banks of miniature incandescent lamps provide major advantages over a single illumination source. These advantages and the functional operation of the mark reading process are discussed along with the double threshold amplifier circuit used to reduce document error rate.

Optimal Multiplier Trees of Carry-Save Adders with Mixed Delay, C. V. Freiman and J. D. Ullman, *Proceedings of IFIP Congress 65*, New York (May 1965). In a recent publication [1964], Wallace has discussed the use of a large tree of carry-save adders in order to achieve a high-speed multiplier in which no intermediate sums are stored. Smaller trees have also been used in combination with stored intermediate sums in machines such as the IBM 7030. In all work reported thus far, it has been tacitly assumed that the maximum delay is the same for all input/output pairs. Many efficient binary adders exist which are not of this form and the fastest basic adders often cannot be of this form because of limitations on the fan power of the basic logic gates. In this paper, we first show how integer programming may be used to design optimal multiplier trees of carry-save adders with arbitrary delay profile. Direct constructive algorithms requiring no integer programming are then presented for two important special cases. Attention is next focused on the case where several passes through the tree are required per multiplication and intermediate sums are stored. Again, both general and specific methods are presented for an optimal multiplier based on minimum storage time. All results presented are directly expandable to adders with any number of homogeneous inputs.

Spill-back From an Exit Ramp of an Expressway, D. C. Gazis, *Highway Research Record*, No. 89, 39-46 (1965). A discussion is given of the problem of control of an oversaturated system comprising an expressway, a highway, and an exit ramp leading from the expressway to the highway. A traffic light is assumed to control the intersection of the exit ramp and the exit highway. The operation of this traffic light is determined which minimizes the delay of vehicles served by the entire system.

SYNTRAN, L. L. Briner, *Proceedings of GUIDE International Twentieth Meeting*, 24-40 (May 1965). An experimental system using a computer for information retrieval was developed by the Applications Development Group in the Data Processing Division, Federal Region, Washington, D. C. The programming system is known as SYNTRAN, from SYNTAX TRANSLATION. It is capable of providing completely automatic abstracting of texts, and retrieval of both abstracts and texts. SYNTRAN has been designed for the abstracting and retrieval of prose, non-fiction texts. It is more thorough than manual systems, is competitive in cost, and, of course, is much faster.

Saturn Guidance Computer Checkout, R. F. Jergel and R. E. Long, *Ground Support Equipment* 7, No. 3, 16-17 (Third Quarter, 1965). This test equipment complex, Aerospace System Test and Evaluation Complex (ASTEC), checks out the Saturn IB/V guidance computer and the computer's companion data adapter. ASTEC provides both manual and programmable automatic modes of operation for testing the computer and adapter as separate entities or in combination as a subsystem of the Saturn instrument unit.

A 375-Nanosecond Main Memory System Utilizing 7-Mil Cores, G. E. Werner and R. M. Whalen, *AFIPS Conference Proceedings 1965* 27, Part 1, 985-993 (November 1965). The availability of ferrite cores with a 7.5-mil inside diameter and a 12-mil outside diameter offers the opportunity to package large memory arrays which are uniquely suited to high-speed operation. A fast array geometry, coupled with the ability to design higher coercivity, faster switching cores with reasonable drive currents, provides the essential ingredients for making ferrite cores a contending technology for very high-speed memory systems. The memory described in this paper has an array capacity of 590,000 bits. The 12-mil cores are assembled on 15-mil centers and mounted into planar configurations of 295,000 bits each on either side of a single contiguous ground plane. The ground plane is multipurpose in that it serves as a return path for all array currents, it acts as a heat sink for dissipating array power and is used to establish a constant array temperature by circulating a temperature-controlled liquid through it. This geometry provides a bit density of 4000 bits/in.², with the longest array wire only 21 in. The memory unit which is logically organized as 8192 words of 72 bits each can execute instructions at a 2.66-Mc/sec reception rate and has an access time including address decoding of 200 nsec. While this performance does not represent the ultimate speed capabilities of toroidal ferrite technology, a geometry is demonstrated which can predictably go much faster.